

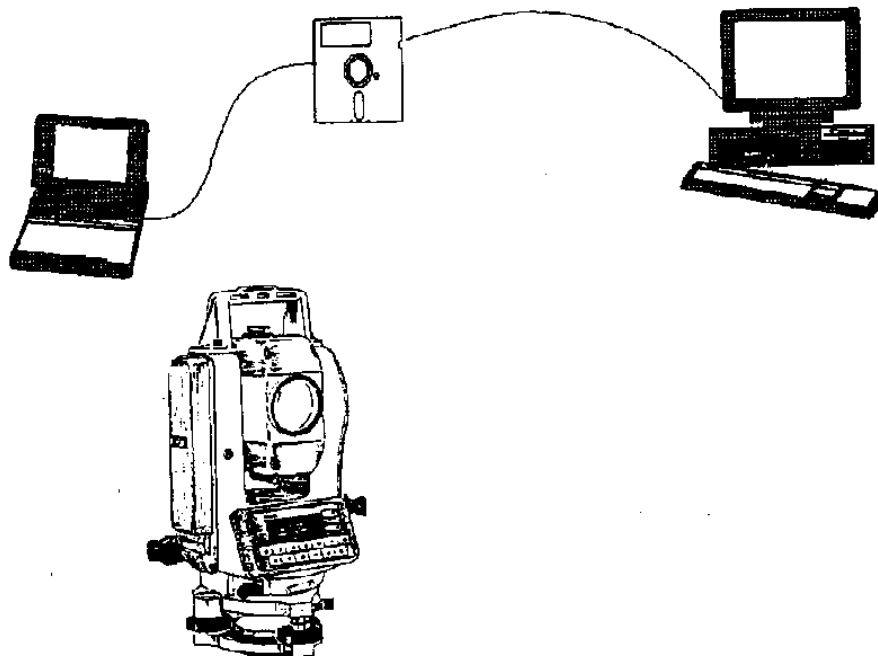
APPENDIX - B

**ELECTRONIC SURVEY DATA SURVEY
REQUIREMENTS**

**BUREAU OF DESIGN AND ENVIRONMENT
SURVEY MANUAL**

January 1995

Electronic Survey Data Requirements



January
1995

INTRODUCTION

This policy delineates the responsibilities of the Illinois Department of Transportation (IDOT) and any firm providing route or land surveying services to IDOT. It only covers the exchange of electronic media and the documents related to identifying and explaining the proper use of the electronic media for survey data.

The department classifies its survey work into two types, route and land.

Route surveys consists of measurements, calculations and field work necessary to establish line and grade for a specific transportation improvement. Route survey also includes topographic surveys, cross sections, hydraulic surveys, and aerial surveys for highway and waterway projects.

Land surveys consists of determining boundaries, writing descriptions of specific parcels of land and the installation and restoration of monuments.

REFERENCE MANUALS

1. Design Manual
2. Survey Manual (under development)
3. Land Acquisition Policies and Procedures
4. Point Codes (under development)

DELIVERABLES

During, or at the completion of the consultant's contract involving electronic surveying work, two deliverables will be required:

1. Hard Copy Document

The paper document will be in a bound volume(s) to allow the department to have a hard copy record (8 ½ " x 11") of the collected data. All paper documents provided to the department must contain the consultant's name. The pages of the survey paper documents will be numbered or identified in such a way as to separate each section of the volume listed in the index. Refer to the department's design manual (section 5 surveying) for additional information. Included will be a list of file names, a description of each file on the diskette(s) transmitted to the department, the name of the software application package used, and the version number.

It must contain a title page, an index, instructions, the raw data, the observation file listing, the compiled reports, the location map, and appropriate sketches.

2. Electronic Copy

The magnetic media, shall contain electronically collected and processed computer data files, which with the paper documents, provides the department a complete and accurate survey contract. Included with the diskette will be a list of file names, a description of each file on the diskette(s) transmitted to the department, the name of the software application package used, and the version number. This information shall be provided in the "Readme.txt" file described below.

It must contain the raw data, the observation file, and the compiled reports.

DELIVERABLE DEFINITIONS

1. Title Page

Contains such information as the consultant's name, route, section, county, survey crew name, date of beginning and completion dates, job number, etc.

2. Index of Documents/Files – The survey information to be provided to the department by the consultant will include an index. The index is a table of contents used to describe and identify the sections of the transmitted survey data.

All magnetic media provided to the department must contain the consultant's name, a list of the directory of the contents of the media, a description of the contents of each file, description of each file, description of the media format (density, means of creating the data file), the date the media was created and project identification. Nonconforming media identification will not be accepted. An example of the proper format is:

Project: _____
Limits: _____
Job Number: _____
Create Date: _____
Format: _____
Density: _____
Contents: _____

A completed example of the proper format is:

Project: IL 83
Limits: St. Charles to North
Job Number: P-91-001-93
Create Date: 3/12/92
Format: DOS Copy Command
Density: DSHD 3.5" Diskette (1.44MB)
Contents: Readme.txt file

One file shall be named "Readme.txt". This file will contain a listing of the contents of each file on the diskette. The listing of each content shall include the limits and type of data. Notes that do not fit elsewhere are to be entered here also.

3. Instructions

The specific directions given to the survey party on how to proceed with the survey. A copy of the negotiation minutes that pertain to the survey work are also to be included.

4. Raw Data – the observations going into the data collector. Raw data from an electronic survey data collector provides a historical record of the original survey data that was collected. After being transferred from the data collector, this data file will not be edited or changed. The raw data file contains original total station data necessary for the

survey including vertical and horizontal angles, dimensions, slope distances, IDOT point codes, point numbers and material codes.

Typically, the raw data file is used to create an observation file which can be edited after the survey is performed. The observation file can be edited using the software for the total station collecting the data. A log file of any changes to the observation file must also be submitted.

A readable hard copy listing of the raw data along with documentation explaining the format(s) is required to be submitted with the survey as a historical record of the project. A readable hard copy listing of the observation file along with documentation explaining the format(s) is required as well.

The raw data must be delivered in both electronic and hard copy formats. The electronic format shall be appropriate for the software used by the consultant. The hard copy format shall likewise be appropriate for the software used by the consultant.

5. Compiled Reports – provides the calculated stations, offsets, and elevations to be used in the plotting of cross sections, topography, and plan and profile sheets. Three (ASCII Coordinate File, Station Offset File, and Cross Section File) hard copy ([See Attachment #1, pages B-5, 6 & 7](#)) reports along with the ASCII electronic file in the same format are required. These electronic files will be loaded into departmental systems and also serve as backup documentation for the hard copy reports.
6. Location Map – a portion of a county or city map which depicts the area covered by the survey. The purpose of this map is to show the general location of the survey work such that it can be readily located in the future. In the case of a hydraulic survey, it might be appropriate to use a quad map for the location map, and the flood plain sections could be shown thereon. A north arrow and the beginning and ending points are to be shown on the map. The map is to be accompanied by a written description of the termini of the survey work. Indicate the city or village in urban areas and sections, township, range, and principal meridian, and county in rural areas. ([See Attachment #2, page B-8](#))
7. Survey Sketches – unscaled drawings, usually rendered by hand, which show topographic information to properly orient the survey data. Several different types of sketches will be required to ensure that further users of the survey data will understand and can duplicate the survey results, verify the locations of control points, and visualize the spatial relationship of key points, significant fixed objects and complex topographic features. All sketches must include a north arrow. If a sketch covers a congested area, please use point numbers with a corresponding table.

Required Sketches are:

- a) Level circuit benchmarks – shows the approximate location and spatial orientation of the benchmark circuit. A written description of each benchmark and its location must accompany the sketch. ([See Attachment #3, pages B-9 & 10](#))
- b) Survey baseline – shows the termini, stationing, and station equations along the baseline, roadway centerline (if not coincidental), and along each intersecting road. Also shows control points along the baseline used as the reference points from which horizontal dimensions are calculated. The recovery ties to all control points

must accompany this sketch. This sketch provides a visual supplement to the raw data provided in item #4 above. ([See Attachment #4, pages B-11 & 12](#))

- c) Topographic sketch – graphically shows significant fixed objects, intersections, structures, streams, utilities, etc. to properly orient user and to permit the user to effectively understand the spatial relationships of the electronic survey data. ([See Attachment #5, page B-13](#))
- d) Control survey – shows the approximate location and spatial orientation of each survey used to provide coordinates (horizontal and/or vertical) of points to which supplementary surveys are adjusted. ([See Attachment #6, page B-14](#)) A written description of each traverse point and its location must accompany the sketch. This sketch provides a visual supplement to the raw data provided in item #4 above.

DATA MEDIA

The only media that will be accepted are DOS compatible 3 ½ “ HD (1.44 MB) floppy diskettes.

DATA FORMATS

All data files, except for the raw data, shall be in ASCII format.

FUTURE DIRECTION

As the department moves toward metric construction plans, we will be requiring that surveys be done in metrics. The above requirements will be revised at that time.

The department is also moving towards the use of digital terrain models instead of the usual cross sectioning procedures. Once the use of DTM's is adopted, the above requirements will be revised to cover their usage.

03/19/93

Illinois Department of Transportation

ASCII Coordinate File Format

From Geodimeter Survey Software

| Column | Data Type | Justification |
|---------|-----------------|---------------|
| 1 - 9 | Point Number | Left |
| 10 - 11 | (blank) | |
| 12 - 22 | Northing | Left |
| 23 - 24 | (blank) | |
| 25 - 35 | Easting | Left |
| 36 - 37 | (blank) | |
| 38 - 45 | Elevation | Left |
| 46 | (blank) | |
| 47 - 49 | Point Code | |
| 50 | (blank) | |
| 51 - 56 | Dimension | Left |
| 57 - 58 | (blank) | |
| 59 - 61 | Material Code | |
| 62 | (blank) | |
| 64 - 85 | Description | Left |
| 86 - 97 | Nominal Station | Left |

| Point Number | Northing | Easting | Elevation | Point Code | Dimen. Code | Mat. Code | Description | Nominal Station |
|--------------|--------------|--------------|-------------|-------------|-------------|------------------------------|-----------------------|-----------------|
| XXXXXXXXXX | XXXXXXXXXXXX | XXXXXXXXXXXX | XXXXXXXX | XXX XXXXXX | XXX | XXXXXXXXXXXXXXXXXXXXXXXXXXXX | XXXXXXXXXXXX | |
| LJ | LJ | LJ | LJ | LJ | LJ | LJ | LJ | LJ |
|1..... |2..... |3..... |4..... |5..... |6..... |7..... |8..... |9..... |
| 6 | 49965.733 | 50076.698 | 690.231 | 101 | | | Foresight Station | |
| 2 | 49644.357 | 49994.235 | 100.000 | 100 | | | Backsight Station | |
| 200 | 49701.992 | 49995.123 | 684.339 | 667 | | 759 | Pavement - Centerline | 28930.000 |
| 201 | 49701.558 | 50007.972 | 684.232 | 668 | | 759 | Pavement - Edge | 28930.000 |
| 202 | 49701.561 | 50013.170 | 683.312 | 604 | | | Ground Shot | 28930.000 |
| 203 | 49700.808 | 50022.522 | 681.014 | 604 | | | Ground Shot | 28930.000 |
| 204 | 49699.252 | 50032.630 | 680.023 | 604 | | | Ground Shot | 28930.000 |
| 205 | 49698.043 | 50036.794 | 676.774 | 604 | | | Ground Shot | 28930.000 |
| 206 | 49697.657 | 50038.796 | 675.410 | 604 | | | Ground Shot | 28930.000 |
| 207 | 49697.570 | 50039.677 | 673.468 | 604 | | | Ground Shot | 28930.000 |
| 208 | 49698.065 | 50042.577 | 672.934 | 604 | | | Ground Shot | 28930.000 |

Purpose: This data is used to plot topographic features electronically through MicroStation. It consists of all shots taken on the survey. Each shot is identified by point number, northing, easting, elevation, point code, dimensions, material code, description, and nominal station.

03/19/93

Illinois Department of Transportation

Cross Section File Format

From Geodimeter Survey Software

| Column | Data Type | Justification |
|---------|-----------------|---------------|
| 1 - 8 | Nominal Station | Right |
| 9 - 13 | (blank) | |
| 14 - 25 | Actual Station | Right |
| 26 - 27 | (blank) | |
| 28 - 35 | Offset | Right |
| 36 | (blank) | |
| 37 - 38 | Direction | |
| 39 - 42 | (blank) | |
| 43 - 50 | Elevation | Right |
| 51 - 52 | (blank) | |
| 53 - 74 | Description | Left |

| Nominal Station | Actual Station | Offset | Dir. | Elevation | Description |
|-----------------|----------------|-------------|-------------|-------------|-----------------------|
| XXXXXXXXXX | XXXXXXXXXXXX | XXXXXXXX | XX | XXXXXXXX | XXXXXXXXXXXXXXXXXXXX |
| RJ | RJ | RJ | | RJ | LJ |
|1..... |2..... |3..... |4..... |5..... |6.....7..... |
| | 288+74.310 | | | | Initial Station |
| 289+30 | 289+31.952 | 0.047 | LT | 684.339 | Pavement - Centerline |
| 289+30 | 289+31.725 | 12.808 | RT | 684.232 | Pavement - Edge |
| 289+30 | 289+31.813 | 18.005 | RT | 683.312 | Ground Shot |
| 289+30 | 289+31.212 | 27.368 | RT | 681.014 | Ground Shot |
| 289+30 | 289+29.820 | 37.499 | RT | 680.023 | Ground Shot |
| 289+30 | 289+28.679 | 41.683 | RT | 676.774 | Ground Shot |
| 289+30 | 289+28.326 | 43.691 | RT | 675.410 | Ground Shot |
| 289+30 | 289+28.253 | 44.574 | RT | 673.468 | Ground Shot |
| 289+30 | 289+28.794 | 47.465 | RT | 672.934 | Ground Shot |
| 289+30 | 289+28.599 | 50.406 | RT | 673.072 | Ground Shot |
| 289+30 | 289+28.718 | 52.932 | RT | 673.385 | Ground Shot |
| 289+30 | 289+28.894 | 55.577 | RT | 673.858 | Ground Shot |
| 289+30 | 289+27.270 | 57.393 | RT | 675.537 | Ground Shot |

Purpose: This data is used to plot cross sections either electronically through GEOPAK or manually. It consists of all shots taken to define the existing terrain elevations. Each shot is identified by location (nominal station, and actual station, and offset), elevation, and surface description. The sort sequence is: nominal station, and then offset (left to right). All points for one cross section station must be in one file.

03/19/93

Illinois Department of Transportation

Station Offset File Format

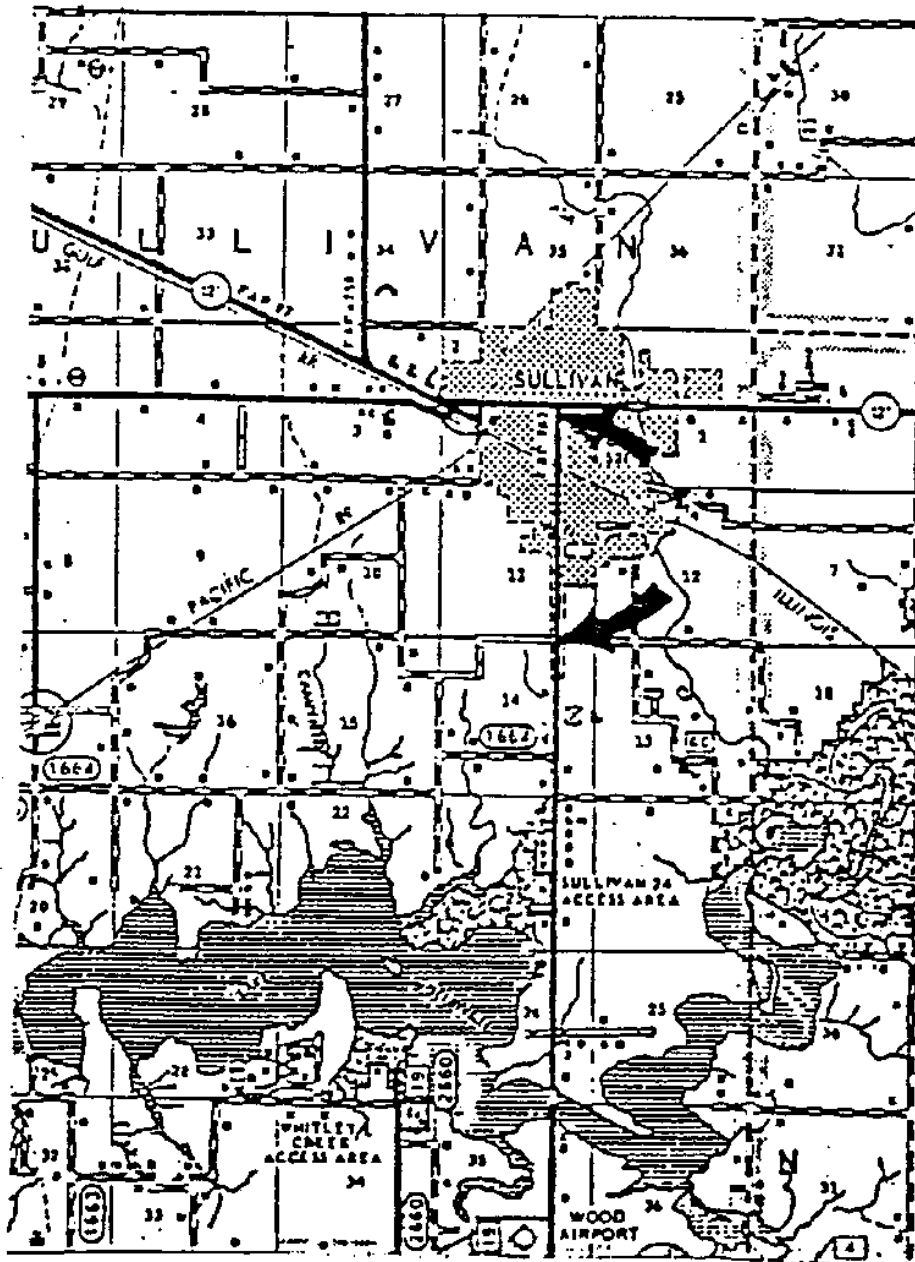
From Geodimeter Survey Software

| Column | Data Type | Justification |
|---------|--------------|---------------|
| 1 - 9 | Point Number | Left |
| 10 - 11 | (blank) | |
| 14 - 25 | Station | Right |
| 26 - 27 | (blank) | |
| 28 - 35 | Offset | Right |
| 36 | (blank) | |
| 37 - 38 | Direction | |
| 46 | (blank) | |
| 43 - 50 | Elevation | Right |
| 51 - 52 | (blank) | |
| 53 - 55 | Point Code | |
| 57 - 58 | (blank) | |
| 58 - 79 | Description | Left |

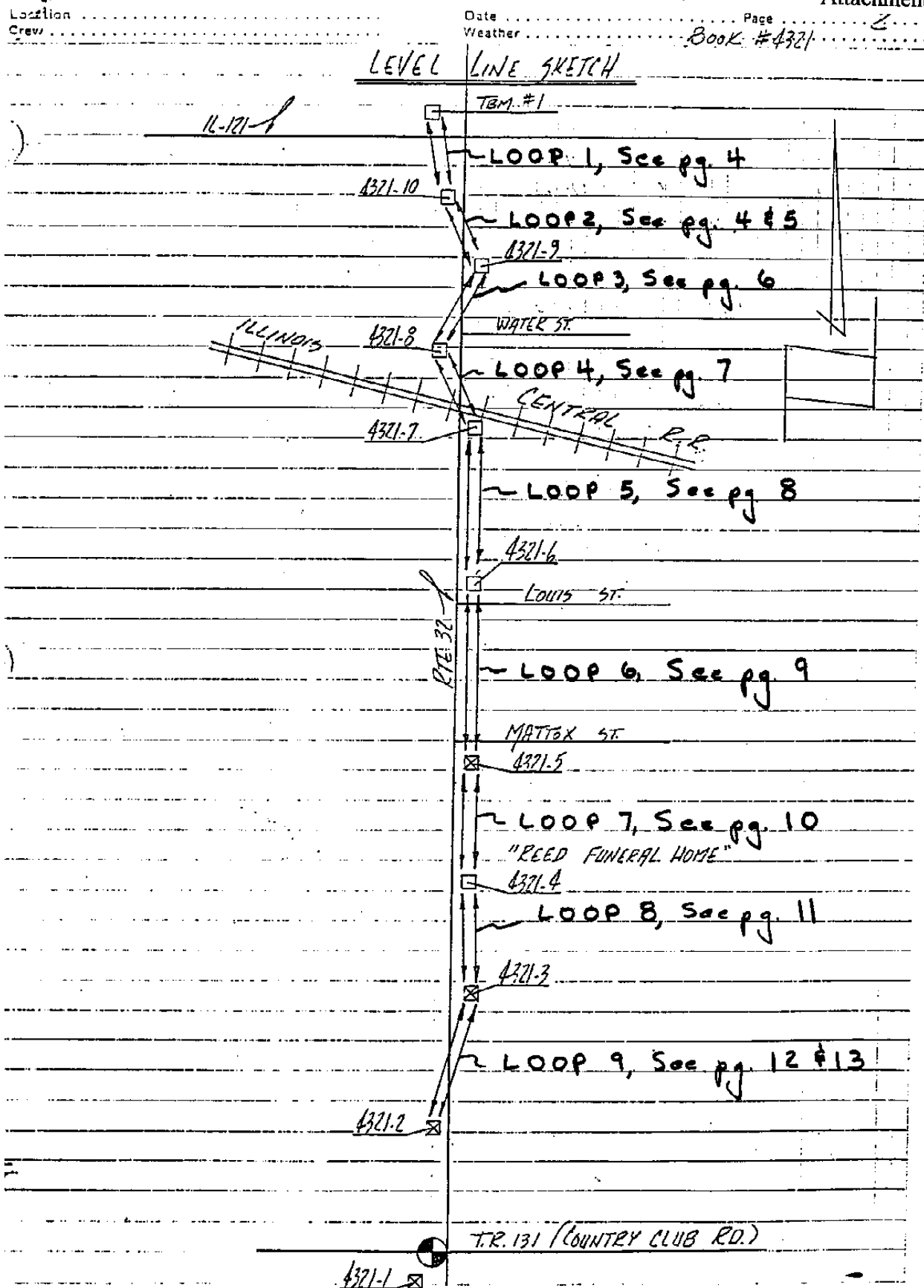
| Point Number | Station | Offset | Dir. | Elevation | Point Code | Description |
|--------------|---------------|-------------|-------------|-------------|-------------|-----------------------|
| XXXXXXXXXX | XXXXXXXXXXXXX | XXXXXXXXXX | XX | XXXXXXXXXX | XXX | XXXXXXXXXXXXXXXXXXXXX |
| LJ | RJ | RJ | | RJ | | LJ |
|1..... |2..... |3..... |4..... |5..... |6..... |7..... |
| 2 | 288+74.310 | 0.001 | | 100.000 | 832 | POT |
| 217 | 289+23.078 | 166.434 | RT | 682.395 | 604 | Ground Shot |
| 215 | 289+25.405 | 75.685 | RT | 683.653 | 604 | Ground Shot |
| 214 | 289+25.680 | 65.855 | RT | 679.493 | 604 | Ground Shot |
| 213 | 289+25.782 | 60.701 | RT | 676.543 | 604 | Ground Shot |
| 212 | 289+27.269 | 57.393 | RT | 675.537 | 604 | Ground Shot |
| 216 | 289+27.591 | 90.542 | RT | 683.189 | 411 | Crop Line |
| 207 | 289+28.253 | 44.573 | RT | 673.468 | 604 | Ground Shot |
| 206 | 289+28.325 | 43.691 | RT | 675.410 | 604 | Ground Shot |
| 209 | 289+28.598 | 50.406 | RT | 673.072 | 604 | Ground Shot |
| 205 | 289+28.679 | 41.683 | RT | 676.774 | 604 | Ground Shot |
| 210 | 289+28.718 | 52.933 | RT | 673.385 | 604 | Ground Shot |
| 208 | 289+28.794 | 47.465 | RT | 672.934 | 604 | Ground Shot |
| 211 | 289+28.894 | 55.577 | RT | 673.858 | 604 | Ground Shot |

Purpose: This data is used to manually plot topographic features. It consists of all shots taken on the survey. Each shot is identified by a point number, location (station and offset), elevation, point code, and description. The sort sequence is station and then offset (left to right).

Attachment #2



SURVEY FROM IL. RT. 121 TO 1.5 MI. SOUTH
ON IL. RTE. 32

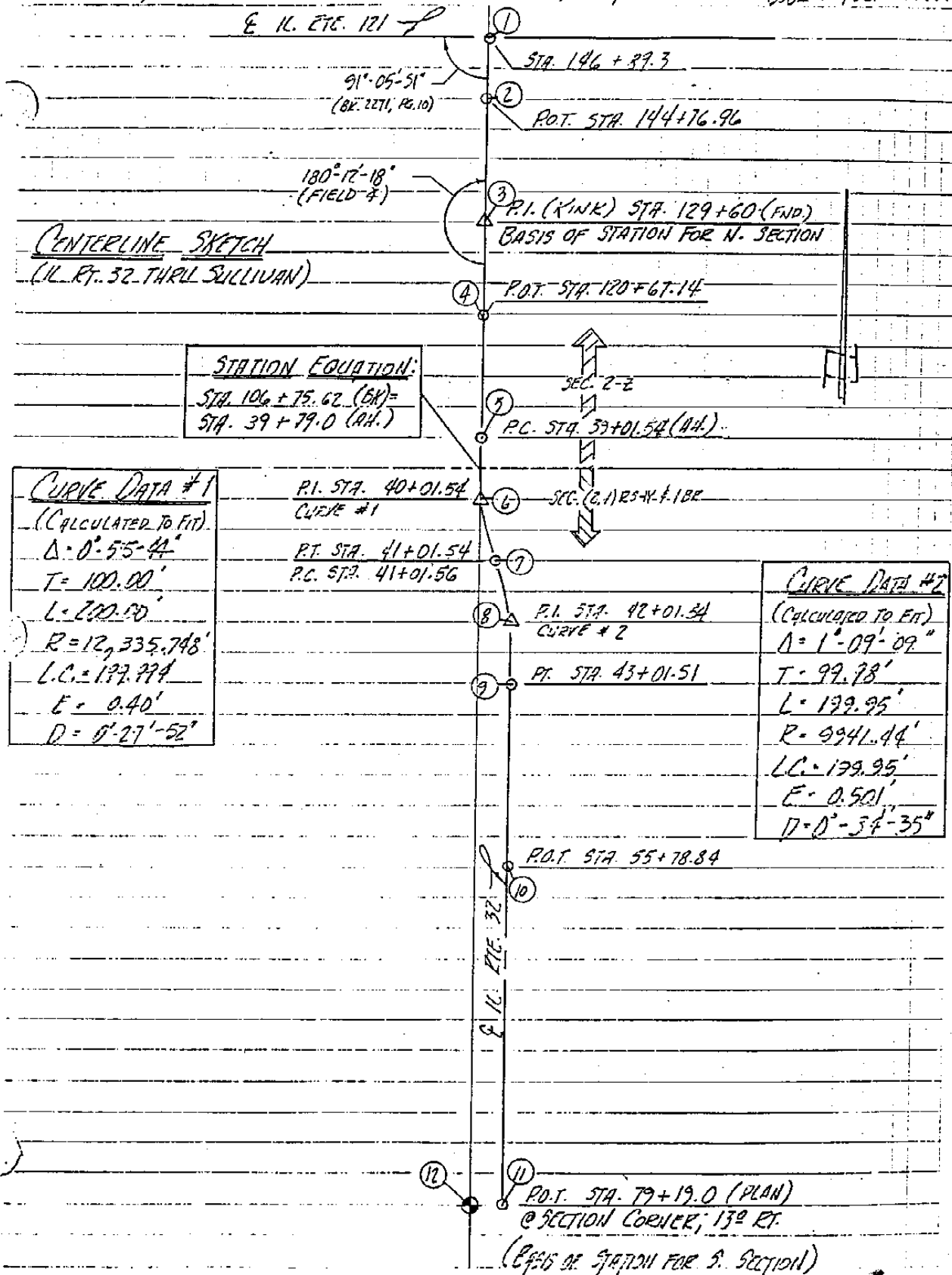


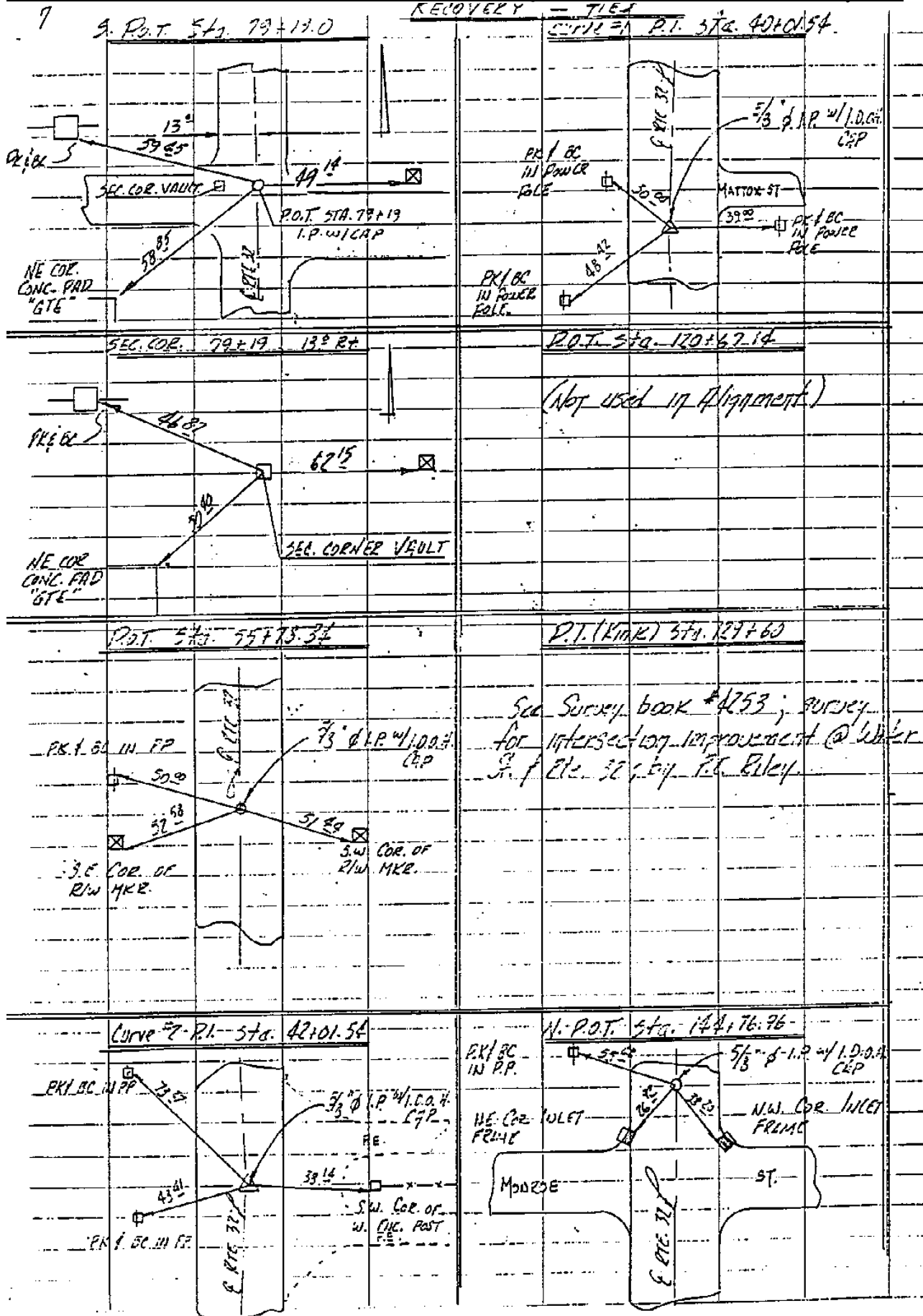
| | | BENCHMARK DESCRIPTIONS | |
|--------------------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------|--|
| 4321-1 | | Top of R/W MKR., S.W. Quad of T.R. 131 (Country Club Rd) & Rte 32, 1.5 Mi. south of Rte 121 STA. 82+10 (AH) ELEV.=646.940 | |
| 4321-2 | | Top of R/W MKR. W. side of Rte 32, 800' S. of T.R. 131 STA. 75+60 (AH) ELEV.=670.875 | |
| 4321-3 | | Top of R/W MKR. E side of Rte 32, In Front of 1-story Red Brick Manufacturing Plant, Sta. 64+05 (AH) Elev. 671.87 | |
| 4321-4 | | S.W. Cor of Road Funeral Home Monument Base E side Rte 32, Sta. 56+50 (AH) ELEV.=672.165 | |
| 4321-5 | | Top of R/W MKR. S.E. Quad of Rt 32 & MATTHEW ST. Sta. 50+50 (AH) ELEV.=674.105 | |
| 4321-6 | | Chis "D" top of Retaining Wall @ N.E. Quad of Rte 32 & Louis St Sta. 46+25 (AH) ELEV.=674.00 | |
| 4321-7 | | Top of N.W. Anchor Bolt to the S.E. ING Signal Sta. 40+00 (AH) ELEV.=673.64 | |
| 4321-8 | | S.W. COR. WEST. CONC. Base of Kerr Mc Gee Sign. @ S.W. Quad of Water & Rte 32 Sta. 129+42 (BK) ELEV.=673.535 | |
| 4321-9 | | Chis "D" N.W. Cor, Westernmost Abandoned Sign Fnd. Sta. 135+35 (BK) Elev. 669.675 | |
| 4321-10 | | N.E. Cor. East Conc. Fnd. to "Subway Sign" West Side of Rte 32 Sta. 144+70 (BK) ELEV.=674.48 | |
| TBM. No. 1 | * | S.E. COR. OF THE CONC. POCK @ THE SOUTH ENTRANCE (CLOSED) TO THE "POWERS" SCHOOL IN THE N.W. QUAD OF INT. 121 & 32. ELEV.=677.515 | |
| TAKEN FROM BK #2271, Ed RILEY SURVEY | | | |

Location FA 762, (IL RTE. 32)
 Crew DRS, JVA, JAB

Date 9-24-92
 Weather 75° F, 12°

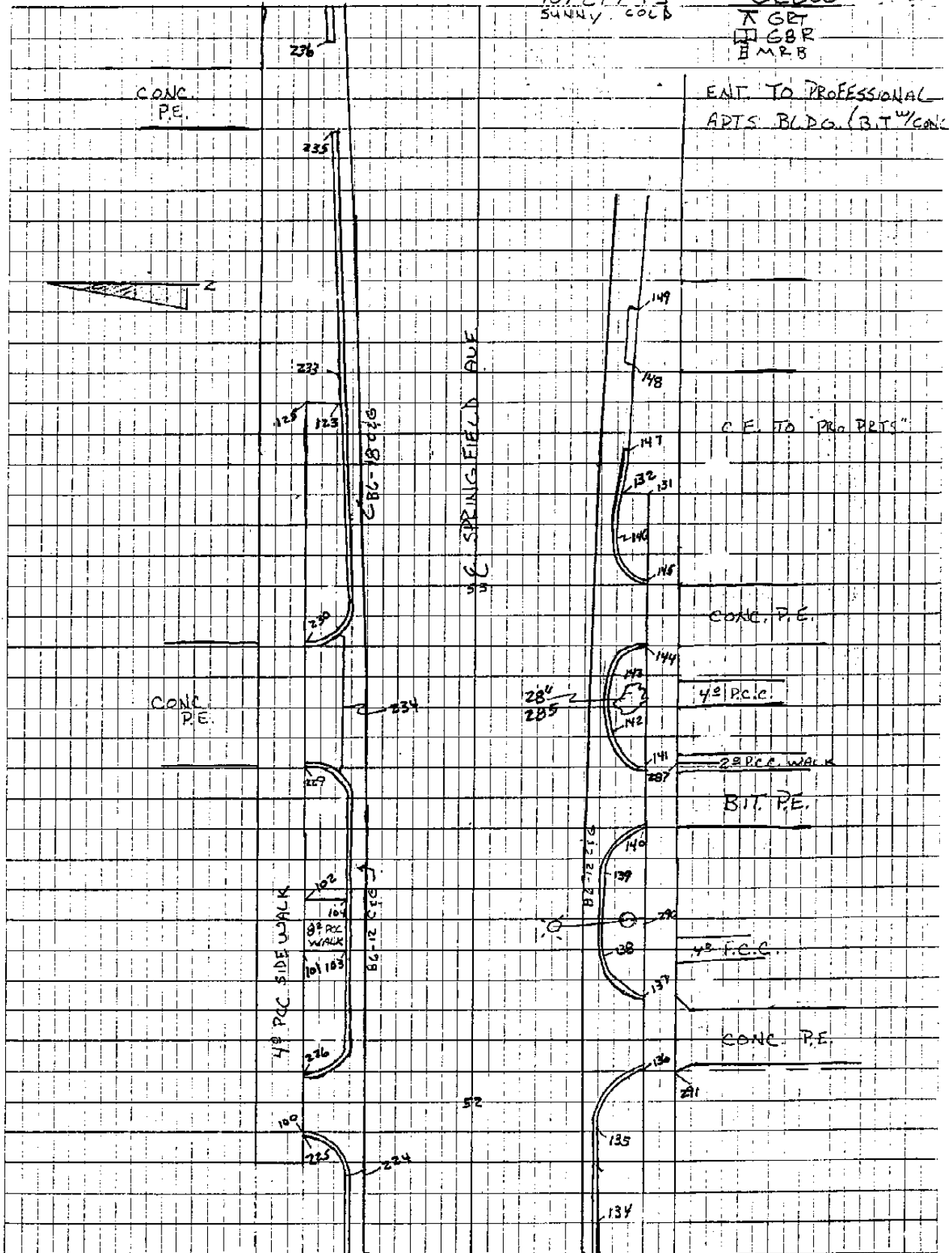
Page Attachment #4
 Book # 4221

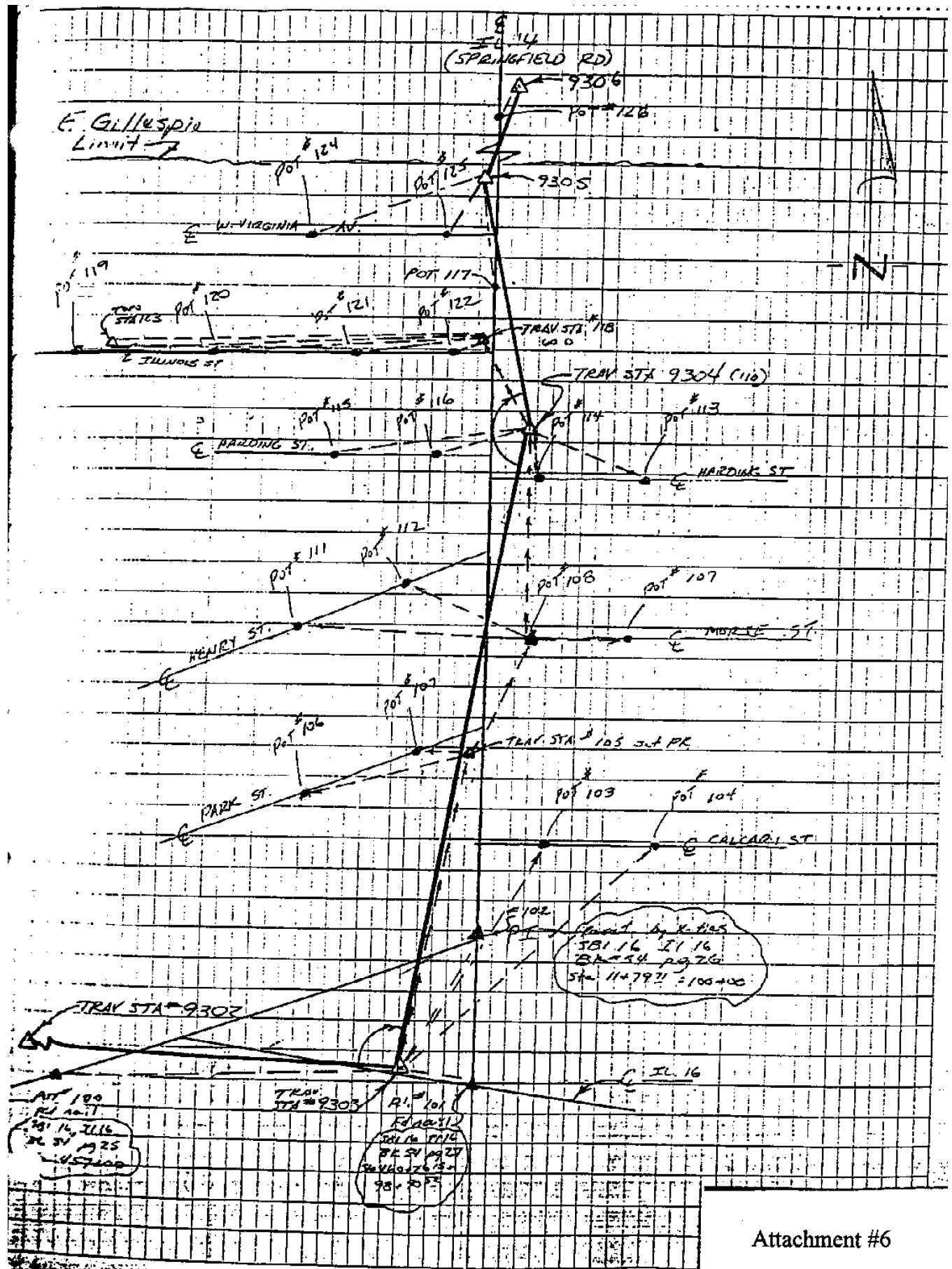




Location SPRINGFIELD FIVE
Crew

Date 10/21/93 Page Attachment #5
Weather SUNNY COLD CREW
A GT
B GBR
B M.R.B





Attachment #6